

EEG-1100A
EEG-1100J
EEG-1100K
EEG-1100G

EEG-9100A
EEG-9100J
EEG-9100K
EEG-9100G

EEG-9200A
EEG-9200J
EEG-9200K
EEG-9200G

PSG INPUT BOX

JE-912AK

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GENERAL HANDLING PRECAUTIONS

This device is intended for use only by qualified medical personnel. Use only Nihon Kohden approved products with this device. Use of non-approved products or in a non-approved manner may affect the performance specifications of the device. This includes, but is not limited to, batteries, recording paper, pens, extension cables, electrode leads, input boxes and AC power.

Please read these precautions thoroughly before attempting to operate the instrument.

- 1. To safely and effectively use the instrument, its operation must be fully understood.**
- 2. When installing or storing the instrument, take the following precautions:**
 - (1) Avoid moisture or contact with water, dust, extreme atmospheric pressure, excessive humidity and temperatures, poorly ventilated areas, and saline or sulphuric air.
 - (2) Place the instrument on an even, level floor. Avoid vibration and mechanical shock, even during transport.
 - (3) Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.
 - (4) The power line source to be applied to the instrument must correspond in frequency and voltage to product specifications, and have sufficient current capacity.
 - (5) Choose a room where a proper grounding facility is available.
- 3. Before Operation**
 - (1) Check that the instrument is in perfect operating order.
 - (2) Check that the instrument is grounded properly.
 - (3) Check that all cords are connected properly.
 - (4) Pay extra attention when the instrument is in combination with other instruments to avoid misdiagnosis or other problems.
 - (5) All circuitry used for direct patient connection must be doubly checked.
 - (6) Check that battery level is acceptable and battery condition is good when using battery-operated models.
- 4. During Operation**
 - (1) Both the instrument and the patient must receive continual, careful attention.
 - (2) Turn power off or remove electrodes and/or transducers when necessary to assure the patient's safety.
 - (3) Avoid direct contact between the instrument housing and the patient.
- 5. To Shutdown After Use**
 - (1) Turn power off with all controls returned to their original positions.
 - (2) Remove the cords gently; do not use force to remove them.
 - (3) Clean the instrument together with all accessories for their next use.
- 6. The instrument must receive expert, professional attention for maintenance and repairs. When the instrument is not functioning properly, it should be clearly marked to avoid operation while it is out of order.**
- 7. The instrument must not be altered or modified in any way.**
- 8. Maintenance and Inspection:**
 - (1) The instrument and parts must undergo regular maintenance inspection at least every 6 months.
 - (2) If stored for extended periods without being used, make sure prior to operation that the instrument is in perfect operating condition.

(3) Technical information such as parts list, descriptions, calibration instructions or other information is available for qualified user technical personnel upon request from your Nihon Kohden distributor.

9. When the instrument is used with an electrosurgical instrument, pay careful attention to the application and/or location of electrodes and/or transducers to avoid possible burn to the patient.

10. When the instrument is used with a defibrillator, make sure that the instrument is protected against defibrillator discharge. If not, remove patient cables and/or transducers from the instrument to avoid possible damage.

WARRANTY POLICY

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the operator's and service manuals.

No other party is authorized to make any warranty or assume liability for NKC's products. NKC will not recognize any other warranty, either implied or in writing. In addition, service, technical modification or any other product change performed by someone other than NKC or its authorized agents without prior consent of NKC may be cause for voiding this warranty.

Defective products or parts must be returned to NKC or its authorized agents, along with an explanation of the failure. Shipping costs must be pre-paid.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

CAUTION

United States law restricts this device to sale by or on the order of a physician.

EMC RELATED CAUTION

This equipment and/or system complies with the International Standard IEC60601-1-2 for electromagnetic compatibility for medical electrical equipment and/or system. However, an electromagnetic environment that exceeds the limits or levels stipulated in the IEC60601-1-2, can cause harmful interference to the equipment and/or system or cause the equipment and/or system to fail to perform its intended function or degrade its intended performance. Therefore, during the operation of the equipment and/or system, if there is any undesired deviation from its intended operational performance, you must avoid, identify and resolve the adverse electromagnetic effect before continuing to use the equipment and/or system.

The following describes some common interference sources and remedial actions:

- 1.Strong electromagnetic interference from a nearby emitter source such as an authorized radio station or cellular phone:
Install the equipment and/or system at another location if it is interfered with by an emitter source such as an authorized radio station. Keep the emitter source such as cellular phone away from the equipment and/or system.
- 2.Radio-frequency interference from other equipment through the AC power supply of the equipment and/or system:
Identify the cause of this interference and if possible remove this interference source. If this is not possible, use a different power supply.
- 3.Effect of direct or indirect electrostatic discharge:
Make sure all users and patients in contact with the equipment and/or system are free from direct or indirect electrostatic energy before using it.
- 4.Electromagnetic interference with any radio wave receiver such as radio or television:
If the equipment and/or system interferes with any radio wave receiver, locate the equipment and/or system as far as possible from the radio wave receiver.

If the above suggested remedial actions do not solve the problem, consult your Nihon Kohden Corporation subsidiary or distributor for additional suggestions.

The CE mark is a protected conformity mark of the European Community. The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC.

This equipment complies with EUROPEAN STANDARD EN-60601-1-2 (1993) which requires EN-55011, class B.

Conventions Used in this Manual and Instrument

Warnings, Cautions and Notes

Warnings, cautions and notes are used in this manual to alert or signal the reader to specific information.

WARNING

A warning alerts the user to possible injury or death associated with the use or misuse of the instrument.

CAUTION






A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

NOTE

A note provides specific information, in the form of recommendations, prerequisites, alternative methods or supplemental information.

Explanations of the Symbols in this Manual and Instrument

The following symbols found in this manual/instrument bear the respective descriptions as given.

Symbol	Description	Symbol	Description
	Type BF applied part		Date of manufacture
	Attention, consult operator's manual		The CE Mark is a protected conformity mark of European Community. The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC.
	Serial number		

Precautions for Input Jack Use

NOTE

Do not perform EEG measurement without the Z, C3, C4, A1 and A2 electrodes.

Use of input jack Z

Connect the lead from the electrode (Z electrode) attached on the patient's nasion to the input jack Z on the electrode junction box. The purpose of this input jack is to eliminate AC interference positively.

NOTE

The input jack Z is also used for checking electrode impedance.

Use of input jacks C3 and C4

Connect the leads from the electrodes attached on the positions C3 and C4 to the input jacks C3 and C4 respectively.

NOTE

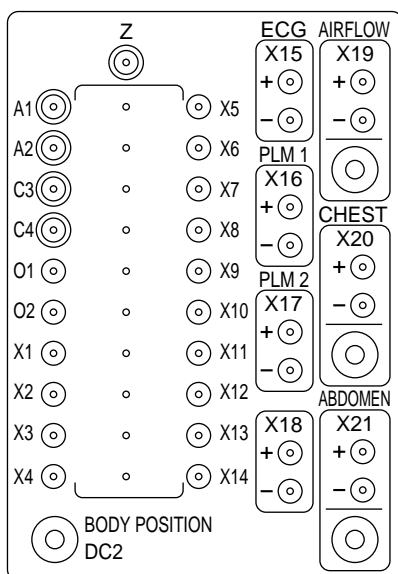
- The C3 and C4 electrodes are the reference electrodes for EEG measurement.
- The input jacks C3 and C4 must be attached for EEG measurement even when the C3 and C4 are not programmed in any montage.

Use of input jacks A1 and A2, C3 and C4 during skin-electrode impedance check

When checking each electrode impedance, connect the leads from the electrode attached on the positions A1, A2, C3 and C4 to the input jacks A1, A2, C3 and C4 respectively.

NOTE

- The A1 and A2 electrodes are the reference electrodes for skin-electrode impedance check.
- The input jacks A1 and A2 in addition to the Z, C3 and C4 must be attached for the electrode impedance check.



JE-914A Mini Junction Box

Checking electrode potentials for all active electrodes

Check the original electrode potential for all active electrodes by programming a montage with the system reference electrode (Select the 0 V button for reference electrode on the Montage dialog box).

Refer to “Programming Patterns” in Section 2 of the Operator’s manual.

The digital EEG displays the EEG waveform in each channel by subtracting two electrode potentials selected to a montage. The subtracted result will be incorrect, if the electrode attachment is not correct, the original electrode potential is flat or unstable, or artifact is superimposed on the original electrode potential. Omit the measurement result if the displayed EEG waveform is incorrect.

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Section 1 General

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Introduction

The JE-912AK PSG Input Box is an electrode junction box to measure polysomnogram. The PSG input box communicates with an electroencephalograph by USB communication. Up to 8 DC signals and SpO₂ can be measured.

This service manual provides useful information to qualified service personnel to understand, troubleshoot, service, maintain and repair this JE-912AK PSG Input Box.

All replaceable parts or units of this instrument and its optional units are clearly listed with exploded illustrations to help you locate the parts quickly.

The “Maintenance” section in this service manual only describes the maintenance that should be performed by qualified service personnel. The Maintenance section in the operator’s manual describes the maintenance that can be performed by the user.

The information in the operator’s manual is primarily for the user. However, it is important for service personnel to thoroughly read the operator’s manual and service manual before starting to troubleshoot, service, maintain or repair this instrument. This is because service personnel need to understand the operation of the instrument in order to effectively use the information in the service manual.

CAUTION

To turn the power off, follow the procedure in “Power Off Procedure” in Section 3 of the EEG operator’s manual. Do not press the power button on the PC unit. If the power button is pressed while a program is running, the program, data file in the hard disk and/or MO disk may be damaged.

Trademarks

Windows is a registered trademarks of Microsoft Corporation.

Service Policy, Service Parts and Patient Safety Checks

Service Policy

Our technical service policy for this PSG input box is to replace the faulty unit, board or part or damaged mechanical part with a new one. Do not perform electrical device or component level repair of the multilayer board or unit. We do not support component level repair outside the factory for the following reasons:

- Most of the boards are multilayer boards with surface mount electrical devices (SMD), so the mounting density of the board is too high.
- A special tool or high degree of repair skill is required to repair the multilayer boards with SMDs.

Disassemble the PSG input box or replace a board or unit in an environment where the PSG input box is protected against static electricity.

As background knowledge for repair, pay special attention to the following:

- You can reduce the repair time by considering the problem before starting repair.
- You can clarify the source of most of the troubles using the information from the troubleshooting tables. Refer to “Troubleshooting” of this manual.

Service Parts

Refer to “Replaceable Parts List” of this manual for the service parts for technical service that we provide.

NOTE

When ordering parts or accessories from your Nihon Kohden representative, please quote the NK code number and part name which is listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use parts and accessories recommended or supplied by Nihon Kohden Corporation to assure maximum performance from your PSG input box.

Patient Safety Checks

Periodic maintenance procedures and diagnostic check procedures are provided in this manual to ensure that the PSG input box is operating in accordance with its design and production specifications. To verify that the PSG input box is working in a safe manner with regard to patient safety, patient safety checks should be performed on the PSG input box before it is first installed, periodically after installation, and after any repair is made on the PSG input box.

For patient safety checks, perform the following checks as described in the IEC60601-1 “Medical electrical equipment - Part 1: General requirements for safety”:

- Protective earth resistance check
- Earth leakage current check
- Enclosure leakage current check
- Patient leakage current check
- Withstanding voltage check

Maintenance Equipment/ Tools

Test equipment

When repairing or calibrating the PSG input box, the following test equipment is required.

- Oscillator: standard type

Checking tool

When checking the internal noise of the PSG input box and skin-electrode impedance check function, the checking tools are necessary. Refer to Section 5 “Maintenance”.

General Information on Servicing

Note the following information when servicing the PSG input box.

CAUTION

Safety

There is the possibility that the outside surface of the PSG input box, such as the operation keys, could be contaminated by contagious germs, so disinfect and clean the PSG input box before servicing it. When servicing the PSG input box, wear rubber gloves to protect yourself from infection.

Liquid ingress

The PSG input box is not waterproof, so do not install the PSG input box where water or liquid can get into or fall on the PSG input box. If liquid accidentally gets into the PSG input box or the PSG input box accidentally drops into liquid, disassemble the PSG input box, clean it with clean water and dry it completely. After reassembling, verify that there is nothing wrong with the patient safety checks and function/performance checks. If there is something wrong with the PSG input box, contact your Nihon Kohden representative to repair it.

Disinfection and cleaning

To disinfect the outside surface of the PSG input box, wipe it with a non-abrasive cloth moistened with any of the disinfectants listed below. Do not use any other disinfectants or ultraviolet rays to disinfect the PSG input box.

- Chlorohexidine gluconate solution:	0.5%
- Benzethonium chloride solution:	0.2%
- Glutaraldehyde solution:	2.0%
- Benzalkonium chloride:	0.2%
- Hydrochloric alkylldiaminoethylglycine:	0.5%

Transport

- Use the specified shipment container and packing material to transport the PSG input box. If necessary, double pack the PSG input box. Also, put the PSG input box into the shipment container after packing so that the buffer material does not get inside the PSG input box.

Caution - continued

- When transporting the board or unit of the PSG input box, be sure to use a conductive bag. Never put the it in an aluminum bag to transport a bord or unit which a lithium battery is mounted. Never wrap the board or unit of the PSG input box and mini junction box in a styrene foam or plastic bag which generates static electricity.

Handling the PSG input box

- Because the outside surface of the PSG input box is made of resin, the outside surface of the PSG input box is easily damaged. So when handling the PSG input box, remove clutter from around the PSG input box and be careful to not damage the PSG input box or get it dirty.
- Because most of the boards in the PSG input box are multilayer boards with surface mount electrical devices (SMD), a special tool is required if remove and solder the elctrical devices on it. To avoid damaging other electrical components, do not remove and solder SMD components yourself.

Measuring and Test Equipment

Maintain the accuracy of the measuring and test equipment by checking and calibrating it according to the check and calibration procedures.

General Safety information

WARNING

- Never use this PSG input box in the presence of any flammable anesthetic gas or high-concentration oxygen atmosphere. Failure to follow this warning may cause explosion or fire.
- Never use this PSG input box in a high-pressure oxygen medical tank. Failure to follow this warning may cause explosion or fire.



Using with an electrical surgical unit (ESU)

- Never use this PSG input box near an ESU. The PSG input box may malfunction due to high-frequency noise from the ESU.
- When using this PSG input box with an ESU, refer to the instruction manual for the ESU. Before measurement, check that the return plate is correctly attached to the patient and that the PSG input box operates correctly when using with the ESU. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached.
- Before using the ESU, remove all needle electrodes and silver ball electrodes from the patient. Failure to follow this warning may cause burn on the patient.

MRI examination


- The PSG input box is not intended to be used during MRI.
- When performing MRI tests, remove all electrodes and transducers from the patient which are connected to this PSG input box. Failure to follow this warning may cause serious electrical burn on the patient due to local heating caused by dielectric electromotive force. For details, refer to the instruction manual for the MRI.

When performing defibrillation

- Before defibrillation, remove from the patient all electrodes and transducers which are connected to connectors that do not have a “” or “” mark. Otherwise, the discharged energy may cause serious electrical burn or shock to the operator.
 - Before defibrillation, remove all electrodes and transducers from the patient which are connected from this PSG input box. If the defibrillator paddle directly contacts these materials, the discharged energy may cause serious electrical burn to the patient.
 - Before defibrillation, all persons must keep clear of the bed and must not touch the patient or any equipment connected to the patient. Failure to follow this warning may cause serious electrical burn, shock or other injury.
-
-

Installation

WARNING

Connect only the specified instruments to the connectors or socket marked with , by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.

CAUTION

When connecting the cables, make sure that each instrument is turned off.

Electrode and Sensor Attachment/Cable Connection

WARNING

- Do not connect the Z electrode lead plug to a ground or equipotential ground. Otherwise, leakage current from another instrument cause electrical shock to the patient.
 - When the JE-914A Mini Junction Box is not used, make sure that the multiple connector cover is firmly attached to the electrode junction box. Failure to follow this warning may cause electrical shock to the patient and operator.
 - Before connecting or disconnecting the DC input cable to the DC input connector, make sure that the power of the external instrument is turned off or DC signal is not output from the external instrument. Failure to follow this warning may cause electrical shock to the patient and operator.
 - Connect only the specified respiration sensor or pickup to the AIRFLOW, CHEST and ABDOMEN connector by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.
-
-

CAUTION

Before attaching a sensor, check whether it contains dry natural rubber or not. Natural rubber may cause allergic reaction with symptoms such as itching, redness, urticaria, swelling, fever, dyspnea, symptoms similar to asthma, reduced blood pressure and shock. If the patient shows any of the above symptoms, immediately stop using the chest movement sensor and perform appropriate medical treatment.

Operation

WARNING

- All activation testing must be applied under the supervision of the physician in charge. Mouth gags, tongue depressors and gauze sponges must always be prepared for use to prevent the patient from biting his tongue or injuring himself during testing because any pattern of flash stimuli may induce seizure activity.

When using the NE-224S Sub-dermal Straight Needle Electrode or Intracranial Electrode

- Do not use the NE-224S sub-dermal straight needle electrode as a measurement electrode for the EEG or evoked potential measurement for any longer than one hour. When measuring the EEG or evoked potential for over one hour, use the EEG disk electrode.
 - Do not check the skin-electrode impedance when using a needle electrode or intracranial electrode. Failure to follow this warning injures the patient because these electrodes will be damaged by electrolyzation inside the body.
-

SpO₂ Measurement

WARNING

- SpO₂ measurement may be incorrect in the following cases.
 - When the carboxyhemoglobin (HbCO) or methemoglobin (metHb) increases abnormally.
 - When dye is injected in the blood.
 - When using an electrosurgical unit.
 - During CPR
 - When measuring at a site where there are venous pulses.
 - When there is body movement.
 - When the pulse wave is small.
 - When measuring the patient with peripheral circulation insufficiency
 - When the SpO₂ probe is used on a neonate, low birth weight infant or patient with a fever or peripheral circulation insufficiency, a slight burn may result from the probe increasing the skin temperature at the attached site by 2 or 3°C (4 or 5°F). Periodically check the attached state of the probe and change the attachment site about every 8 hours.
 - When performing MRI tests, remove the probes from the patient. The local heat generated from the induced electromagnetic field may burn the patient's skin. For details, refer to the instruction manual for the MRI.
-

CAUTION

- Always dry the connectors and do not let them contact liquid. Otherwise, SpO₂ measurement result may be incorrect.
 - If the attachment site is dirty with blood, clean it before attaching the probe. If there is nail polish on the attachment site, remove the polish. Otherwise, the amount of transmitted light decreases and measured data may be incorrect or measurement cannot be performed.
 - When measuring SpO₂ under intense light (surgical light, bilirubin lamp, sunlight), cover the probe with a blanket or cloth. Otherwise, noise may interfere.
 - Turn off the power of cellular telephones, small wireless devices and other devices which produce strong electromagnetic interference around a patient (except for PHS telephones allowed by the hospital administrator). Otherwise, radio waves from devices such as cellular telephones or small wireless devices may be mistaken as pulse waves and the displayed data may be incorrect.
-

Cleaning or Disinfecting

CAUTION

Turn off the power before cleaning or disinfecting. Otherwise you may get an electrical shock or the PSG input box may malfunction.

Maintenance

CAUTION

Do not disassemble the PSG input box when checking the PSG input box or performing maintenance. If there is any damage or the PSG input box is suspected to be faulty, attach an “Unusable” or “Repair request” label to the system and contact your Nihon Kohden distributor or representative.

WARNING

The programs contained in the system program installation CD-ROM are protected by copyright law and international treaties.

Unauthorized reproduction or distribution of this software, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.

NOTE

- When the PSG input box is used in a high-frequency electric field, the displayed waveform may be thicker.
- When the optional JL-951T3 SpO₂ Adapter is connected to the PSG input box and there is an extreme power surge, an “SpO₂ UNSTABLE PULSE” message appears. To prevent noise from the AC power line, ground the electroencephalograph with a low impedance ground lead (i.e. 1.5 m or less), connect the AC power cord to another AC outlet and/or turn off the power of surrounding equipment.
- When the system program version of the EEG-1100A/J/K/G Electroencephalograph is 03-01, 03-02 or 03-11, the PSG input box can be connected. Upgrade the system program with the provided system disk. Refer to “Upgrading the EEG System Program” in Section 2.

Specifications

Amplifier

Number of input jacks	
EEG inputs:	6
Extra inputs:	14
Bipolar inputs:	14
Respiration inputs:	3 {RESP F (flow), RESP C (chest), RESP A (abdomen)}
DC inputs:	8
Position sensor input:	1
SpO ₂ adaptor input:	1
Input impedance	100 MΩ
Input circuit current	Less than 5 nA
Internal noise level	Less than 1.5 μVp-p (0.53 to 60 Hz)
CMRR	105 dB or greater at 60 Hz (bipolar input: 60 dB or greater)
Gain	×469.73
Low-cut filter	0.08 Hz (TC = 2 s)
High-cut filter	120 Hz (-18 dB/oct)
Offset tolerance	±600 mV
A/D conversion	16 bits (97 nV/LSB)
Sampling and hold	All electrodes at a time
Sampling frequency:	100, 200, 500 Hz

Safety

Safety standard	IEC 60601-1 (1988) IEC 60601-1 Amendment 1 (1991) IEC 60601-1 Amendment 2 (1995) IEC 60601-2-26 (1994) EN 60601-1-1 (1992-06) with AMI (1995)
Type of protection against electric shock	Class I (when connecting to the EEG-1100/EEG-9100/EEG-9200 electroencephalograph)
Degree of protection against electric shock	
Electrode jacks, respiration jacks, SpO ₂ connector:	Type BF applied part
Degree of protection against harmful ingress of water	Not protected (IPX0)
Degree of safety of application in flammable gas	Not suitable for use in the presence of a flammable anaesthetic mixture with air or oxygen or nitrous oxide
Mode of operation	Continuous

Electromagnetic Compatibility

IEC60601-1-2 (1993)
CISPR11(1990) Group1 CLASS B

Dimensions and Weight

JE-912AK:	185 (W) × 72 (D) × 167 (H) mm, 1.0 kg
JE-914A:	76 (W) × 25 (D) × 124 (H) mm, 0.2 kg (Cable length: 2.8 m)

1. GENERAL

Operation conditions

Temperature	10 to 35° C (50 to 95° F)
Humidity	30 to 80 % (non-condensing)
Atmospheric pressure	70 kPa to 106 kPa

Transport and Storage Conditions

Temperature	-20 to 65° C (-4 to 149° F)
Humidity	10 to 95 % (non-condensing)
Atmospheric pressure	70 kPa to 106 kPa

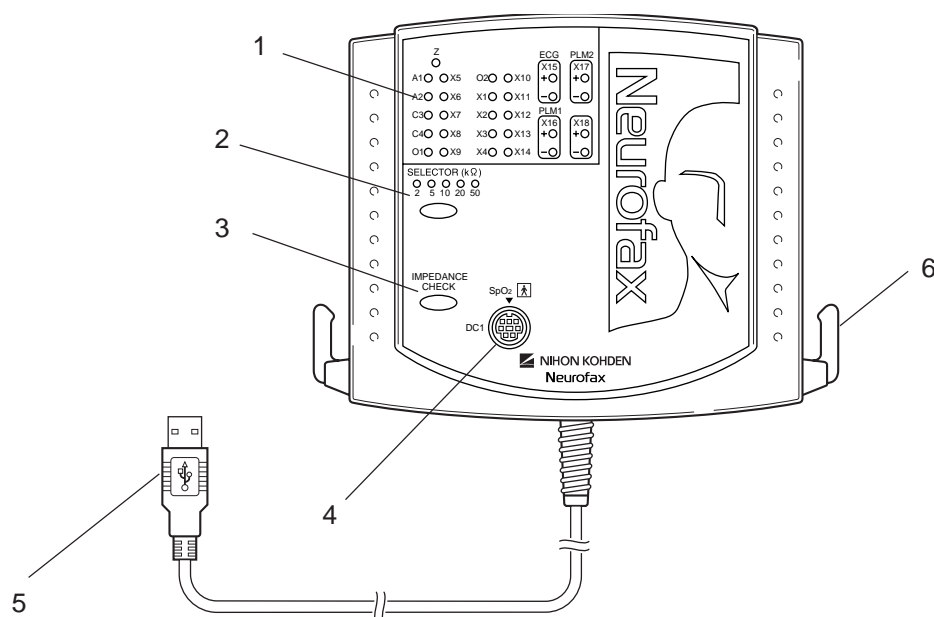
Panel Descriptions

JE-912AK PSG Input Box

WARNING

Connect only the specified instruments to the connectors or socket marked with \triangle , by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.

Front panel

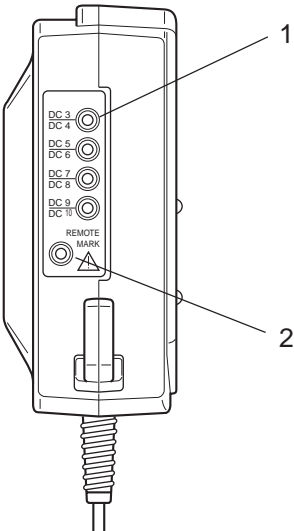


Name

1. Impedance display LED
2. 2, 5, 10, 20 50 k Ω SELECTOR
(Impedance preset key)
3. IMPEDANCE CHECK key
4. SpO₂ connector
5. USB cable
6. Cord hanger

1. GENERAL

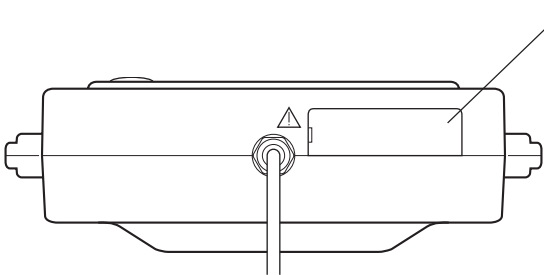
Left side panel



Name

- 1. DC input connector
- 2. REMOTE MARK connector

Bottom panel



Multiple connector
Connects to the JE-914A Mini Junction Box. To open the multiple connector cover, pry the cover off with a flat blade screwdriver.

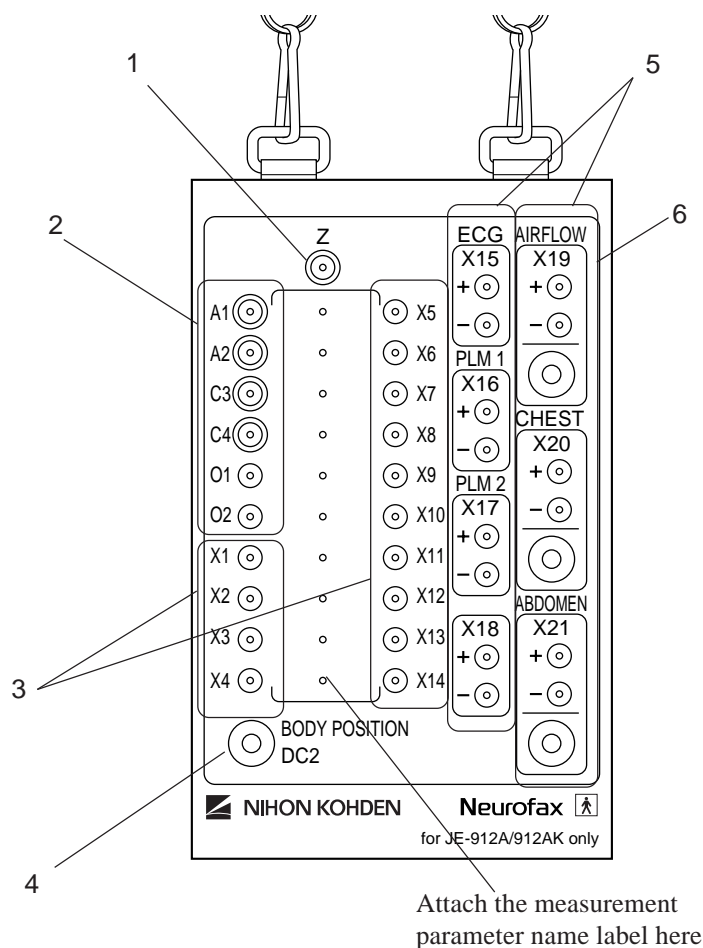
CAUTION

Only connect the JE-914A Mini Junction Box. When another type of mini junction box is connected, the PSG input box will malfunction.

JE-914A Mini Junction Box

WARNING

Connect only the specified instruments to the connectors or socket, by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.

**NOTE**

Either of the following combinations cannot be used.

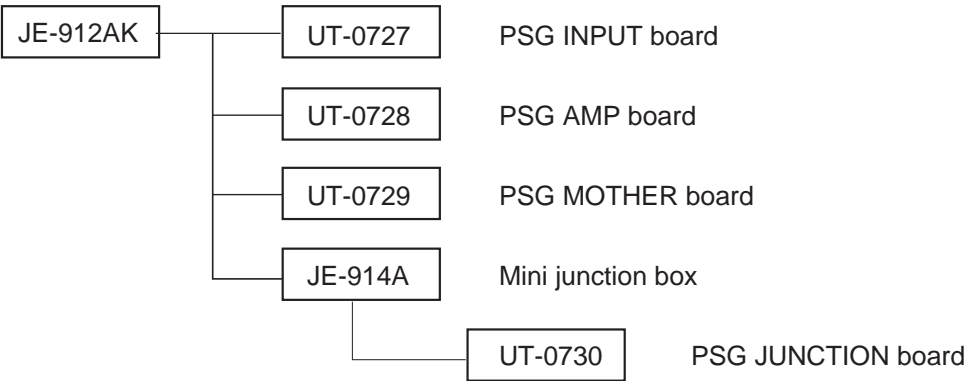
- X19 jacks and AIRFLOW connector
- X20 jacks and CHEST connector
- X21 jacks and ABDOMEN connector

If either of the above combinations is used, the signal from the X19, X20 or X21 jacks is measured.

Name

1. Z jack
2. Electrode jack
3. Extra input jack
4. BODY POSITION connector
5. Bipolar derivation jack
6. Respiration pickup/sensor jack

Composition



Section 2 Troubleshooting and Error Messages

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How to Troubleshoot

Use this section to locate, identify and solve a problem in the PSG input box or an error message displayed on the screen. The troubleshooting tables in this section are divided into general problems and displayed error messages.

1. Determine which troubleshooting table to use.
2. In the “Problem” or “Error Message” column, find the trouble item that matches the problem or error message.
3. Do the action recommended in the “Action” column. (Do the first action recommended in the “Action” column).
4. If the problem or error message is not solved, do the next action recommended in the “Action” column. (If this does not solve the problem, do the next recommended sections.)
5. If none of the actions solve the problem, contact your Nihon Kohden distributor or representative.

WARNING

When checking a cable connection, close the EEG application program, turn off the power of the electroencephalograph and all connected external instruments, and unplug the AC power cord from the AC outlet (For the procedure, refer to the next page). Failure to follow this warning may cause electrical shock.

After checking the cable connection, turn on the power of all components, then restart the PC unit.

Closing the Program and Shutting Down Windows

1. Open the Windows Task Manager.

When the mouse does not operate:

- 1) Press the Ctrl + Alt + Del key. The Windows Security dialog box opens.
- 2) Select Task Manager to open the Windows Task Manager dialog box.

When the keyboard does not operate:

- 1) Right-click the task bar. The pop-up menu opens.
- 2) Select Task Manager to open the Windows Task Manager dialog box.

2. Select the program to close.

3. Select the End Task button.

4. Shut down Windows.

- 1) Select Shut Down from the Start menu. Or, press the Ctrl + Esc key, then press the U key. The Shut Down Windows dialog box opens.
- 2) Select “Shut Down” in the “What do you want the computer to do ?” list box.
- 3) Select the OK button. Windows shuts down and the PC unit power is automatically turned off.

Troubleshooting

Waveform Acquisition

NOTE

Before measurement, confirm the following:

- The examination room is free from artifact-causing sources.
- The electrodes are firmly attached to the patient.
- The electrodes and electrode leads are not dirty, damaged or frayed.

If not, pulse noise caused by static electricity or generated by a display may be superimposed on the EEG waveform. Refer to “Instrument Location” in Section 2 of each electroencephalograph operator’s manual.

Problem	Possible cause	Action
Noise or artifact is superimposed on the waveforms.	The electrode lead is faulty.	Check the continuity of the electrode lead with a multimeter. If the electrode lead is faulty, replace it with a new one.
	One or more of the leads from the Z, C3 and C4 input jacks are not attached to the patient.	Attach these leads to the patient because the Z electrode and C3 and C4 electrodes are necessary for EEG measurement.
	The bed is not grounded.	If the bed is metal, ground it.
	The electroencephalograph is not grounded.	If the AC outlet on the wall does not have a ground terminal, ground the electroencephalograph with the provided ground lead.
	Several medical electronic instruments are used together.	Perform equipotential grounding for each instrument.
	There is an AC outlet or table tap near the patient or bed.	Arrange the measurement environment so that there is no influence from an AC power line.
	The PC unit or printer is placed near the patient or electrode junction box.	Arrange the measurement environment so that unwanted radio frequency does not affect the measurement.
	A desk lamp or fluorescent light is turned on.	Turn the desk lamp or fluorescent light off.
	The patient touched some metal part.	Prevent the patient from touching metal parts.
	The patient is using an electric blanket.	Turn the electric blanket off and unplug the AC power cord, then use another warming method.
	There is a cellular phone near the patient.	Turn the cellular phone off.

2. TROUBLESHOOTING AND ERROR MESSAGES

Problem	Possible cause	Action
The waveform is not stable.	One or more of the leads from the Z, C3 and C4 input jacks are not attached to the patient.	Attach these leads to the patient because the Z electrode and C3 and C4 electrodes are necessary for EEG measurement.
	New and old electrodes or different types of electrodes are used together.	Do not use new and old electrodes or different types of electrodes together. This may cause high polarization voltage.
The waveform sometimes becomes flat.	The skin electrode contact impedance of the C3 or C4 is high.	Clean the electrode attachment to reduce the impedance, and reattach the electrode.
During waveform acquisition the following message appears. “The disk is full. Close the current file to exit the acquisition program. Insert a new disk. [CAUTION] Do not turn off the power of the main unit or connected instruments (Photo Drive unit or MO drive). This can cause loss of EEG data and damage to the hard disk.”	The storage drive (the MO disk or hard disk which saves the EEG data file) is almost full.	Click the OK button on the message dialog box, then end the measurement and save the file. Refer to "Starting and Ending EEG Measurement - Ending the Measurement and Saving the File" in Section 5 of the EEG Operator's manual. After saving the file, prepare a new MO disk, or delete unnecessary files in the hard disk.
The waveform is not displayed.	The color of the waveform and background is the same.	Use a different color for waveform and background.
	The Display setting in the Pattern table is set to "Off".	Set the Display setting to "On" for necessary channels.
The AC filter does not function.	The AC filter setting is not correct.	Select the correct AC filter setting (50 or 60 Hz) in the System program.
	Noise is not caused by AC line influence.	Use the proper filter according to the artifact.
Noise in AV derivation.	An unused electrode for AV derivation is selected in the AV Delete dialog box.	Delete unnecessary electrodes for AV derivation in the AV Delete dialog box.
The electrode name on the screen is indicated in red.	The electrode that is used for measurement is not selected for the storage electrode.	Select the electrode for the storage electrode in the Electrodes to be Saved dialog box of the System program.
	The electrode is selected for the AV derivation but not selected for the storage electrode.	Select all electrodes which are selected for the AV derivation for the storage electrode in the Electrodes to be Saved dialog box of the System program.
The amplifier setting (sensitivity, time constant or high-cut filter) does not change with the Amp bar.	The amplifier setting is not set to "ACC".	Set the amplifier setting to ACC with the pattern table in the System program. You can temporarily change the amplifier setting in the Acquisition program and Review program.
The Acquisition program does not open.	---	When an error appears, follow the instructions on the dialog box.
	Faulty USB cable connection.	Turn off the power of the PC unit, then check that the USB cable from the PSG input box is correctly connected to the PC unit.
	Faulty PSG input box.	Replace the PSG input box.

Problem	Possible cause	Action
No calibration waveform appears on the screen.	Faulty PSG MOTHER board.	Replace the PSG MOTHER board or PSG input box.
Artifact is superimposed on all calibration waveforms.		
Only baselines appear on the screen.		
No waveform appears on the screen.		
Artifact is superimposed on all signals input from the electrode jacks.	Faulty PSG MOTHER board if no SELECTOR (Impedance threshold display) LED on the PSG input box lights.	Replace the PSG MOTHER board or PSG input box.
	Faulty PSG INPUT board.	Replace the PSG INPUT board.
	Faulty PSG AMP board.	Replace the PSG AMP board.
A specific electrode signal does not appear.	Faulty electrode lead.	Replace the electrode lead.
	Faulty PSG INPUT board.	Replace the PSG INPUT board.
	Faulty PSG AMP board. An amplifier corresponding to the signal is faulty.	Replace the PSG AMP board or PSG input box.
Artifact is superimposed on a specific electrode signal.	Faulty electrode lead.	Replace the electrode lead.
	Faulty electrode jack on the mini junction box.	Replace the PSG JUNCTION board or mini junction box.
	Faulty PSG INPUT board. An amplifier corresponding to the signal is faulty.	Replace the PSG INPUT board or PSG input box.
	Faulty PSG AMP board. An amplifier corresponding to the signal is faulty.	Replace the PSG AMP board or PSG input box.
No DC input signal appears on the screen.	Faulty PSG AMP board.	Replace the PSG AMP board or PSG input box.
Artifact is superimposed on all DC input signals.		
A specific DC input signal does not appear on the screen.	Faulty PSG AMP board. An amplifier corresponding to the signal is faulty.	Replace the PSG AMP board.
Artifact is superimposed on a specific DC input signal.		
SpO ₂ data is not displayed.	The “On/Off” setting of the “DC01” channel (SpO ₂ channel) in the DC Input Conversion Display Setting dialog box is set to “Off” (Pattern table → DC Conversion button).	Set the “On/Off” setting to “On”. (DC Input Conversion Display Setting dialog box → Set a Channel dialog box → On/Off area).
The respiration waveform input to the AIRFLOW, CHEST or ABDOMEN connectors is not displayed.	A respiration pickup is connected to the corresponding X19 to X21 jack.	Remove the respiration pickup from the corresponding jack*.
The signal input to any of the X15 to X21 bipolar derivation jack	The reference electrode (G2) is not set to “0 V”.	Set the reference electrode to “0 V”.

NOTE

- Either of the following combinations cannot be used.
 - X19 jacks and AIRFLOW connector
 - X20 jacks and CHEST connector
 - X21 jacks and ABDOMEN connector
 If either of the above combinations is used, the signal from the X19, X20 or X21 jacks is measured.
- When the PSG input box is used in a high-frequency electric field, the displayed waveform may be thicker.

2. TROUBLESHOOTING AND ERROR MESSAGES

Control

Problem	Possible cause	Action
When the power is turned on, Windows does not start.	Faulty PSG input box.	1. Turn the power of the PC unit off. 2. Remove the USB cable from the PC unit. 3. Restart the PC unit. If Windows starts correctly, the PSG input box is faulty. Replace the PSG input box.
	Problem with the Windows operating system.	Reinstall the Windows operating system and EEG system program. Refer to the service manual of each electroencephalograph.
	Faulty PC unit.	Replace the PC unit.
The EEG application program does not work correctly.	A screen saver program is active.	Close the screen saver program.
	Another windows application program is active.	Close all Windows application programs. Or, delete the application program if it conflicts with the EEG system program.
	The two PSG input box are used and the ID number of the second PSG input box is not set to "2".	Set the ID number of the second PSG input box to "2" . Refer to "PSG Mother Board" in Section 3.
	The USB cable from the PSG input box is not connected to the PC unit.	Turn off the power of the PC unit, then connect the USB cable to the PC unit correctly.
	Faulty PSG input box.	Replace the PSG input box if an error message for the PSG input box appears.
	Problem with the EEG application program.	Reinstall the EEG system program.
	Faulty PC unit.	Replace the PC unit.

Error Messages

Following is a list of error messages during operation or the power on self check for the PC unit. To solve the problem if an error message appears, find the displayed error message from the table, then do the action recommended in the Action column.

Acquisition Program

Error Message	Possible Cause	Action
The IMPEDANCE CHECK key on the PSG input box has been pressed.	When the power is turned on, the IMPEDANCE CHECK key on the PSG input box is pressed, or the IMPEDANCE CHECK key makes a short-circuit.	Do not press the IMPEDANCE CHECK key when the power is turned on. If the IMPEDANCE CHECK key is faulty, replace the PSG INPUT board.
	The connection between the PSG INPUT board and PSG MOTHER board is disconnected.	Check the cable connection. If the flat cable is faulty, replace it with a new one.
The SELECTOR key on the PSG input box was pressed during startup.	When the power is turned on, the SELECTOR key on the PSG input box is pressed, or the SELECTOR key makes a short-circuit.	Do not press the SELECTOR key when the power is turned on. If the SELECTOR key is faulty, replace the PSG INPUT board.
	The connection between the PSG INPUT board and PSG MOTHER board is disconnected.	Check the cable connection. If the flat cable is faulty, replace it with a new one.
<< USB 901 >> The electrode junction box has been disconnected. The Acquisition program will be closed after saving the acquired data. Please connect the electrode junction box, and restart the program.	Faulty USB cable connection.	Check that the USB cable from the PSG input box is correctly connected to the PC unit, then open the Acquisition program.
<< USB 902 >> No electrode junction box was detected. Confirm the electrode junction box is connected and restart the Acquisition program.	The PSG input box is not recognized.	Check that the USB cable from the PSG input box is correctly connected to the PC unit, then open the Acquisition program. If the same error message appears again, reinstall the PSG input box driver, or replace the PSG input box.
<< USB 903 >> The electrode junction box is disconnected or there is a data transmission error. After the Acquisition program closes, turn off the power, confirm the electrode junction box is connected and restart the Acquisition.	Faulty data communication between the PSG input box and PC unit.	<ol style="list-style-type: none"> 1. Close the Acquisition program. 2. Turn the PC unit off. 3. Check that the USB cable is correctly connected to the PC unit. 4. Restart the PC unit. 5. Open the Acquisition program.
<< USB 904 >> An overflow occurred during data transmission from the electrode junction box. Restart the Acquisition program	Overflow occurs during data transfer.	<ol style="list-style-type: none"> 1. Close the Acquisition program. 2. Turn the PC unit off. 3. Check that the USB cable is correctly connected to the PC unit. 4. Restart the PC unit. 5. Open the Acquisition program.
The input boxes have save ID. Disconnect one input box or set different ID's for each input box.	The two PSG input box are used and the ID number of the second PSG input box is not set to "2".	Set the ID number of the second PSG input box to "2". Refer to "PSG Mother Board" in Section 3.

2. TROUBLESHOOTING AND ERROR MESSAGES

SpO₂ Measurement

The SpO₂ error message is displayed on SpO₂ channel of the extended channel bar and event bar. Solve the problem referring the following table. When the SpO₂ error message is displayed, the SpO₂ value becomes 0 V.

Error Message	Possible Causes	Action
SpO ₂ UNSTABLE PULSE	Patient body movement.	Check the patient condition. Remove the cause by changing the attachment site, etc.
	Probe attachment is unstable.	Firmly attach the probe to the patient.
SpO ₂ CONNECTOR OFF	SpO ₂ adaptor is disconnected from the PSG input box	Firmly connect the SpO ₂ adaptor to the PSG input box.
	Faulty SpO ₂ adaptor	Replace the SpO ₂ adaptor.
SpO ₂ CHECK PROBE	Probe is detached from the patient.	Check the probe attachment condition.
	Probe is disconnected from the SpO ₂ adaptor.	Firmly connect the probe to the SpO ₂ .
SpO ₂ WEAK PULSE	Poor peripheral circulation	Check the patient condition. Remove the cause by changing the attachment site, etc.
	Probe is attached too tight and prevents circulation.	Reattach the probe.
SpO ₂ PULSE SEARCH	Searching for correct pulse waveform	Wait until the pulse waveform is detected.
	Pulse waveform is rough and SpO ₂ cannot be measured.	Check the probe attachment condition.
	Probe is detached from the patient.	Reattach the probe.
SpO ₂ NO PULSE	Poor peripheral circulation	Check the patient condition. Remove the cause by changing the attachment site, etc.
	Probe is attached too tight and prevents circulation.	Check the probe attachment condition.
	Probe is detached from the patient.	Reattach the probe.
SpO ₂ CHECK PROBE SITE	Probe attachment site is inappropriate.	Refer to the probe operator's manual and attach the probe on the appropriate site.
	Probe is past the expiration date.	Replace the probe with a new one.
SpO ₂ LIGHT INTERFERE	The measurement site is under surgical light, bilirubin light, sunlight, etc.	Cover the probe with a blanket or cloth.
	The AC filter setting is not correct	Check the AC filter setting in the System Program.
SpO ₂ PROBE FAILURE	Faulty probe.	Replace the probe with a new one.
SpO ₂ hardware failure	Faulty SpO ₂ adaptor	Replace the SpO ₂ adaptor.

NOTE

When the optional JL-951T3 SpO₂ Adapter is connected to the PSG input box and there is an extreme power surge, an "SpO₂ UNSTABLE PULSE" message appears. To prevent noise from the AC power line, ground the electroencephalograph with a low impedance ground lead (i.e. 1.5 m or less), connect the AC power cord to another AC outlet and/or turn off the power of surrounding equipment.

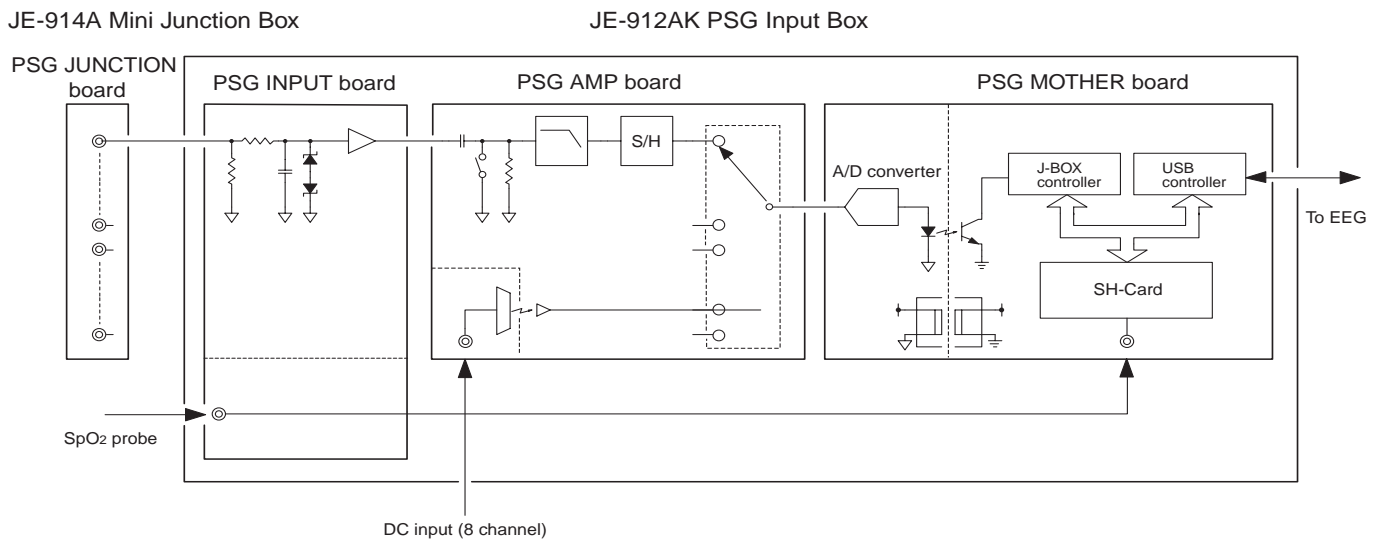
Section 3 Board Description

- General 3.1
 - Block Diagram 3.1
- PSG INPUT Board and PSG AMP Board 3.2
- PSG MOTHER Board 3.6
- Settings When Using Two PSG Input Boxes 3.8

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General

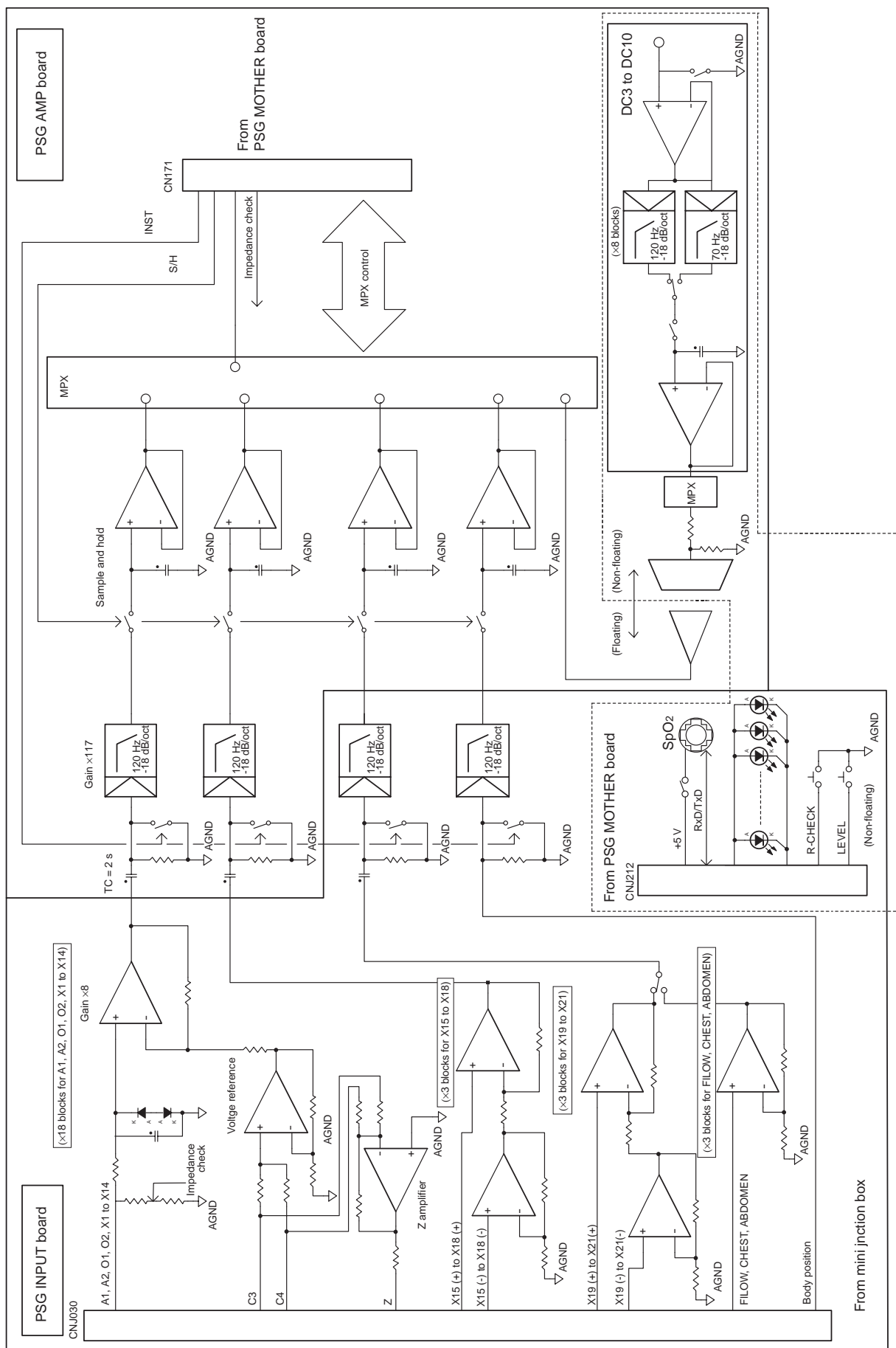
Block Diagram



The PSG input box consists of the PSG INPUT board, PSG AMP board and PSG MOTHER board. The JE-912AK PSG input box has 4 dual DC input connectors (8 channels). The general functions of the PSG input box are to:

- amplify the polysomnogram signals picked up from the electrodes, sensors SpO₂ probe
- amplify the DC input signals from the DC input connectors.
- simultaneously sample the amplified signals at the frequency of 1 kHz,
- convert the sampled analog signals to digital serial data,
- output the digital data to the PC unit by USB communication
- measure the skin-electrode contact impedance and display the skin-electrode contact impedance with the LEDs

PSG INPUT Board and PSG AMP Board



PSG INPUT board

Electrode potential signals from the JE-914A Mini Junction Box are processed as follows. The top of each EEG amplifier circuit and respiration pickup/bipolar deviation circuit has an input protection circuit to limit the input voltage within ± 9 V.

EEG Primary Amplifier Circuits

- 2 second time constant circuit
Provides a 2 second time constant.
- Primary operational amplifier ($\times 8$)
Amplifies the difference between the two input signals 8 times.

System Reference Voltage Generation Circuit

Averages the electrode potential between C3 and C4 and amplifies 1.14 times. This voltage is used for the system reference voltage for waveform acquisition.

Z Signal Generation Circuit

Averages the electrode potential between C3 and C4. This voltage is fed back to the Z electrode to reduce artifact.

Bipolar Derivation Primary Amplifier Circuit:

Primary operational amplifier
Amplifies the difference between pair of input signals for bipolar derivation 8 times.

Respiration Pickup Circuit/Airflow Sensor Input Circuit

- Primary operational amplifier
Respiration pick up circuit:
Amplifies the difference between pair of input signals for bipolar derivation 8 times.

Airflow sensor input circuit:
Buffers the signal from airflow sensor

- 2 second time constant circuit
Provides a 2 second time constant.
- Reset circuit
Resets the trace to the baseline.
- Secondary operational amplifier ($\times 117$)
Amplifies the signals 117 times.
- Anti-aliasing circuit (120 Hz, -18dB/Oct)
Filters any aliasing signal.

3. BOARD DESCRIPTION

Body Position Sensor Input Circuit

- Buffer amplifier
Provides 1.5 M Ω input impedance.
- Reset circuit
Resets the trace to the baseline.
- Attenuator
Attenuates the signals 1/4.
- Anti-aliasing circuit (120 Hz, -18dB/Oct)
Filters any aliasing signal.

PSG AMP board

EEG Secondary Amplifier Circuit/Bipolar Deviation Secondary Amplifier Circuit

- 2 second time constant circuit
Provides a 2 second time constant.
- Reset circuit
Resets the trace to the baseline.
- Secondary operational amplifier ($\times 117$)
Amplifies the signals 117 times.
- Anti-aliasing circuit (120 Hz, -18dB/Oct)
Filters any aliasing signal.

Sample and Hold Circuit

Samples and holds signals at 1 kHz sampling frequency.

Impedance Check Indicator

- Impedance check LEDs
Shows the result of the electrode impedance check.
- Impedance threshold LEDs
Shows the skin-contact impedance check threshold.

DC Input Circuit

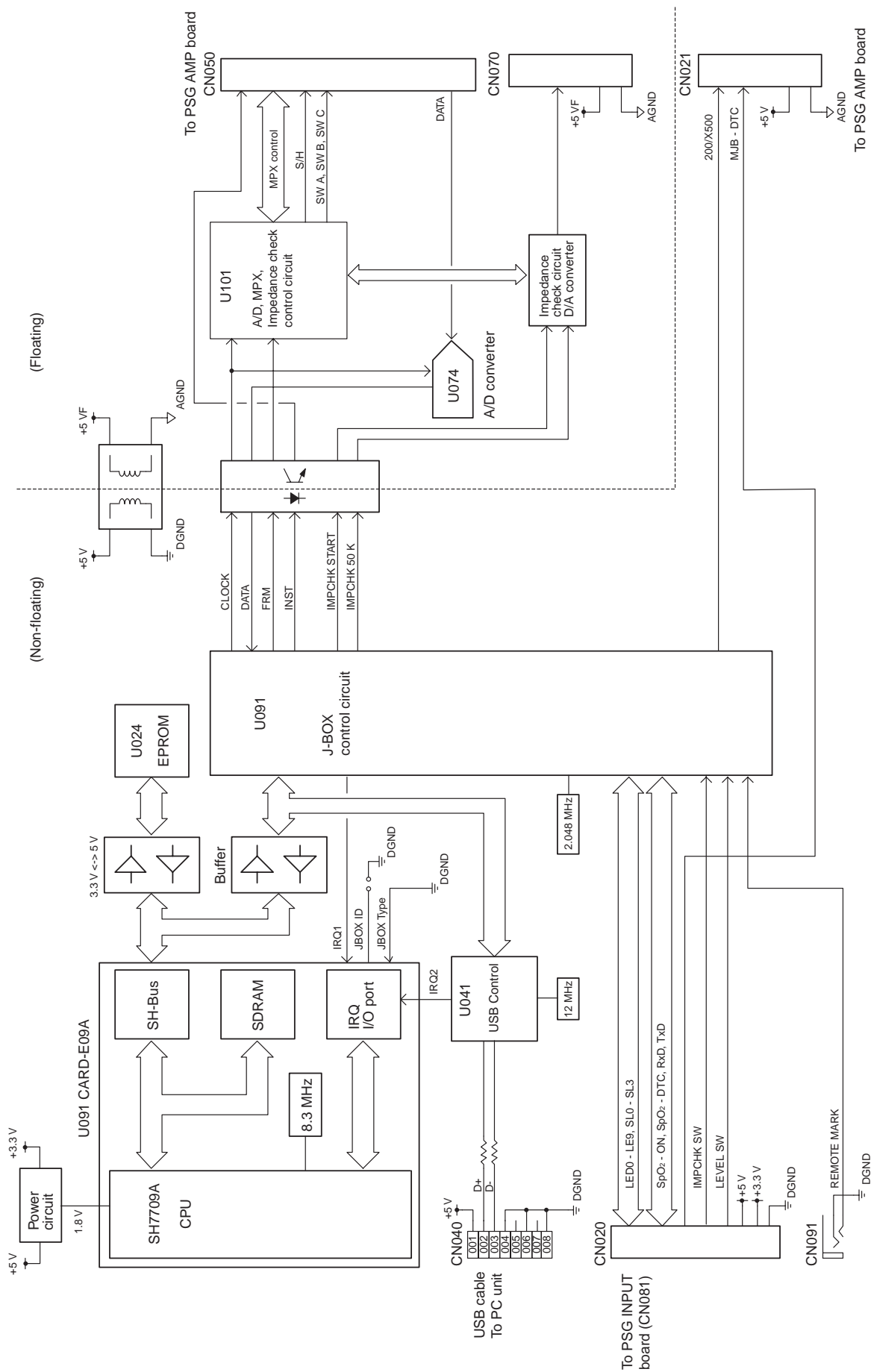
- Buffer amplifier
Provides 1.5 M Ω input impedance
- Reset circuit
Resets the trace to the baseline.
- Anti-aliasing circuit (70, 120 Hz, -18dB/Oct)
Filters any aliasing signal.

- Sample and hold circuit (1 kHz)
Samples and holds signals at 1 kHz sampling frequency.

Multiplexing Circuit

Multiplexes the data from the sample and hold circuit and outputs it as serial data.

PSG MOTHER Board



This board consists of the following components:

PSG Input Box Control Circuit

- Controls the overall operation of the PSG input box at 100 MHz clock frequency using a SH7709A CPU (U091 CARD-E09A). The EPROM (256 kB×16 bit) contains the program to control the PSG input box operation.
- Simultaneously controls the reset circuits of all the amplifiers in the PSG input box.
- Controls the impedance check function. The skin-electrode contact impedance is calculated and the check result is displayed on the LEDs on the PSG INPUT board and sent to the PC unit.

Power Supply Circuit

On the non-floating circuit

- +5 V: Power supply from the PC unit
- +3.3V: Power supply for digital circuits
- +1.8 V: Power supply for CARD-E09A

On the floating circuit

The following powers are generated by the DC-DC converter.

- +5 VF: Power supply for floating circuits.

Isolation Circuits

The photocouplers are used for transferring the digital data from the floating circuit to the non-floating circuit.

A/D Conversion Control Circuit/ Impedance Check Control Circuit

- A/D conversion control circuit
Convert the analog EEG signals, sensor signals and DC input signals into digital signals. First, the analog signal is sampled and held. Second, the sampled and held data is multiplexed. Third, the multiplexed data is converted into digital EEG signals with a 16 bit A/D converter.
- Impedance check control circuit
The impedance check current is generated by an 8 bit D/A converter.

USB Communication Control Circuit

Controls the communication between the PSG input box and PC unit.

J012 Jumper Switch

This switch sets the ID number of the PSG input box.

Short: 1 (default setting)

Open: 2

Settings When Using Two PSG Input Boxes

You can measure the polysomnogram for two patients simultaneously by using two PSG input boxes. To use two PSG input boxes, do the following.

1. Set the ID number to “2” for the second PSG input box.
The ID number can be set by the J012 jumper switch on the PSG MOTHER board in the PSG input box. The default setting is “1”. To change the setting, refer to the service manual. When the power of the electroencephalograph is turned on, the 10 k Ω or 20 k Ω impedance display LED lights to indicate the ID number.
ID 1: 10 k Ω
ID 2: 20 k Ω
2. Create the shortcut icons for the first and second PSG input boxes. Refer to “Settings When Using Two PSG Input Boxes” in Section 2 of the Operator’s manual.

Section 4 Disassembly

- Before You Begin 4.1
 - Warnings, Cautions and Notes 4.1
 - Required Tools 4.1
- Disassembly 4.2

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The procedures in this section tell how to remove, replace and install major components in the PSG input box.

- To remove the connection cables, refer to “Cable Connections” in Section 2 of the Operator’s manual.

Before You Begin

Warnings, Cautions and Notes

Removing, replacing and installing major components should be done only by qualified service personnel.

WARNING

- **To avoid the possibility of injury to yourself or damage to the PSG input box, do not install or remove any component or change switch settings while the power is on.**
 - **To avoid accidental discharge of static electricity which could damage the components of the PSG input box, use a grounded wrist strap when installing or removing any component of the PSG input box.**
 - **Before connecting or disconnecting a cable, close the EEG application program, shut down Windows, turn off all components and unplug the AC power cord from the AC outlet.**
-
-

CAUTIONS

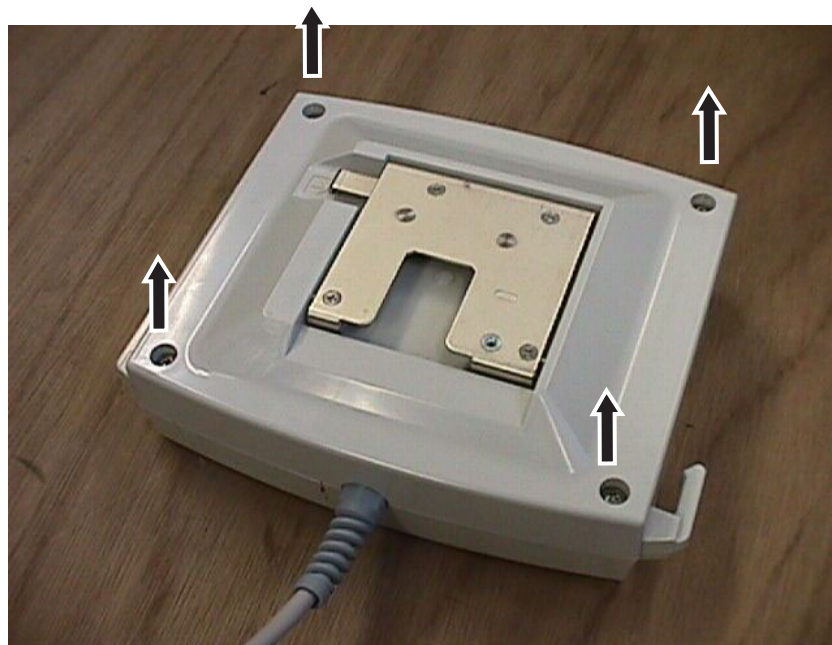
- **Removal and replacement of any components in the PSG input box should only be done by qualified service personnel.**
 - **Use only parts recommended by Nihon Kohden to assure maximum performance from your PSG input box.**
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-

Required Tools

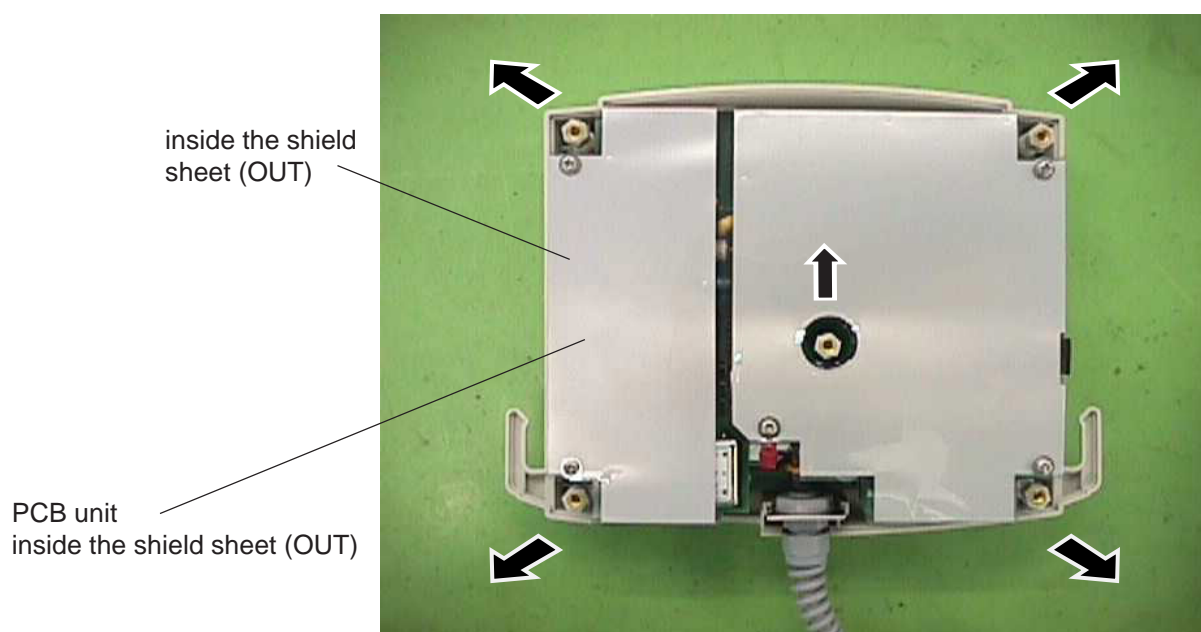
- Anti-static bench mat
- Wrist ground strap
- Phillips screwdriver (insulated type, for M3 and M4 screws)
- Hex socket driver (for 8 mm floating bolt, 5.5 mm spacer bolt and nut)
- Tweezers

Disassembly

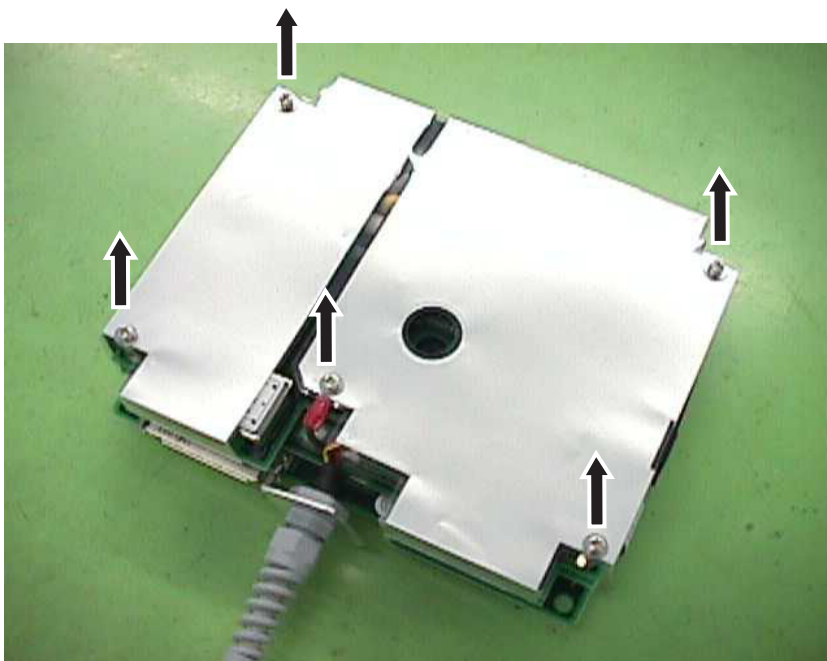
1. Turn the PSG input box front side down.
2. Remove the four M4 binding head screws which fasten the rear cover to the front cover.



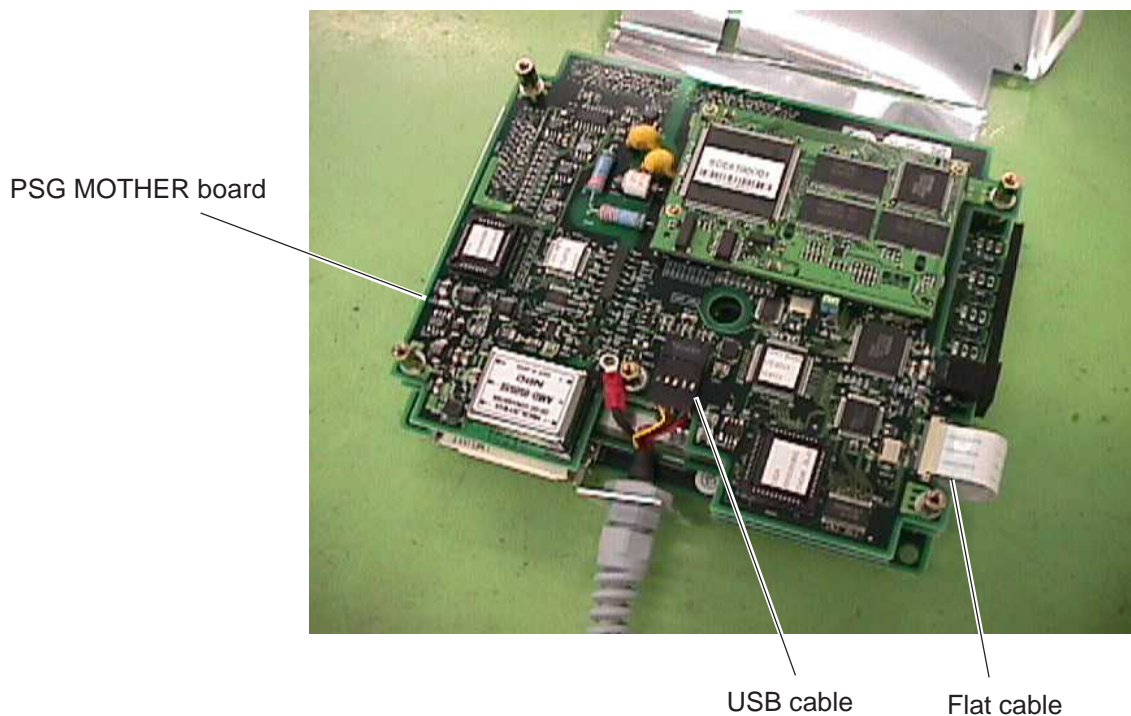
3. Remove the rear cover.
4. Remove the five 8 mm floating bolts which fasten the PCB unit to the front cover.



5. Remove the PCB unit from the front cover.
6. Remove the five M3 screws with spring washers and open the shield sheet (OUT).

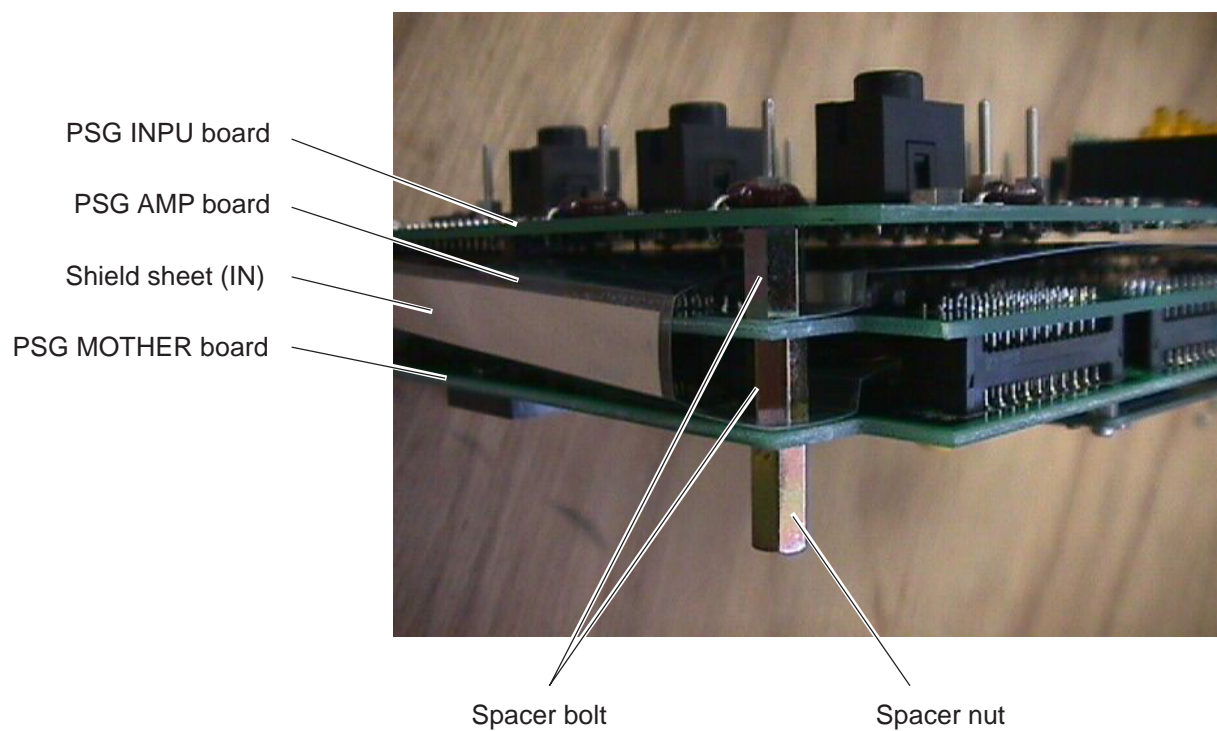


7. Remove the flat cable and USB cable which are connected to the PSG MOTHER board.



4. DISASSEMBLY

The boards are connected with 5.5 mm spacer bolts and 5.5 mm spacer nuts.



Section 5 Maintenance

Checking the PSG Input Box	5.1
Checking Noise	5.1
Checking the Skin-electrode Impedance Check Function	5.2
Checking the EEG Input Circuit	5.3
Checking the Amplifier	5.3
Checking the Input Signal for Each Channel	5.4

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Checking the PSG Input Box

Checking Noise

Use the EEG noise checker to check the internal noise of the PSG input box. This checker shorts circuits all EEG inputs as shown in the circuit diagram. Assemble the EEG noise checker locally with parts that are purchased locally or from your Nihon Kohden distributor or representative.

1.

Connect the EEG noise checker to the multiple connector of the PSG input box.
2.

Start the Acquisition program.
3.

Set the EEG instrument to the following settings.

High-cut filter:

60 Hz

Time constant:

0.3 s

Sensitivity:

1 μ V/mm

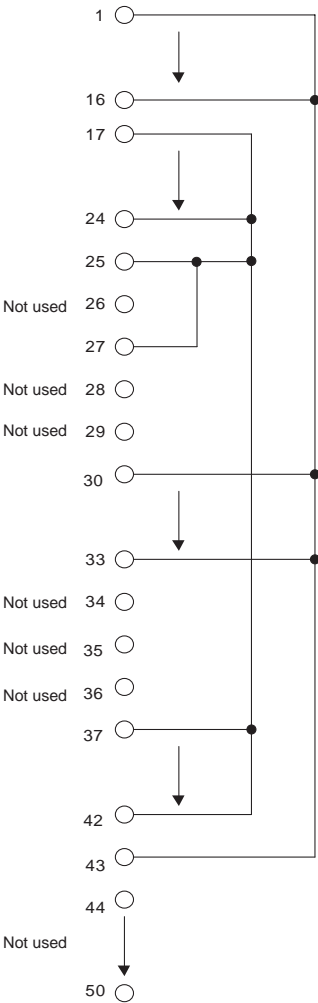
AC filter:

Off

Montage:

Any montage except E lead connection pattern.

Circuit diagram



To PSG input box Noise checker

Required Parts

Description	Qty	Code No.
Connector PCR-S50FS	1	545287
Housing PCR-LS50LA	1	545394

Checking the Skin-electrode Impedance Check Function

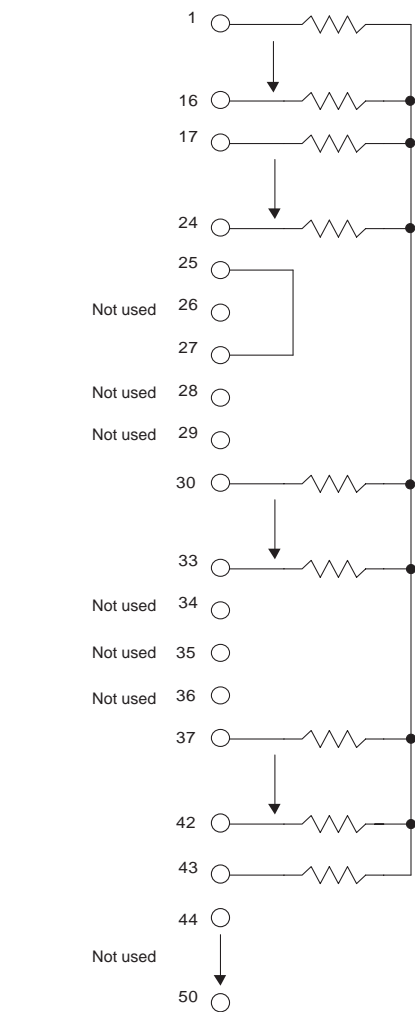
Use the EEG impedance checker to check the skin-electrode impedance check function. This checker shorts circuits all EEG inputs as shown in the circuit diagram. Assemble the EEG impedance checker locally with parts bought locally or from your Nihon Kohden distributor or representative.

We recommend assembling the five different checkers to perform the impedance check for the five different resistance values.

	Checker 1	Checker 2	Checker 3	Checker 4	Checker 5
Resistor	2.0 kΩF	4.99 kΩF	10.0 kΩF	20.0 kΩF	49.9 kΩF

1. Connect the EEG impedance checker to the multiple connector of the PSG input box.
2. Start the Acquisition program.
3. Do the skin-electrode impedance check with the 5 different checkers. Refer to “Checking the Skin-electrode Impedance” in Section 5 of the EEG operator’s manual.

Circuit diagram



Required Parts

Description	Qty	Code No.
Resistor MRS25F2001 2.0 kΩF	35	227051
Resistor MRS25F4991 4.99 kΩF	35	227434
Resistor MRS25F1002 10.0 kΩF	35	227728
Resistor MRS25F2002 20.0 kΩF	35	228014
Resistor MRS25F4992 49.9 kΩF	35	228398
Connector PCR-S50FS	1	545287
Housing PCR-LS50LA	1	545394

Checking the EEG Input Circuit

Checking the Amplifier

Use the EEG input checker to check amplifiers for each electrode on the EEG input circuits on the PSG input box. This checker divides the applied signals to 1/10000. (Example: 500 mV to 50 μ V). Assemble the EEG input checker locally with parts that are purchased locally or from your Nihon Kohden distributor or representative.

1.

Connect the EEG input checker to the multiple connector of the PSG input box.
2.

Start the Acquisition program.
3.

Set the EEG instrument to the following settings.

High-cut filter:

120 Hz

Time constant:

0.3 s

Sensitivity:

10 μ V/mm

AC filter:

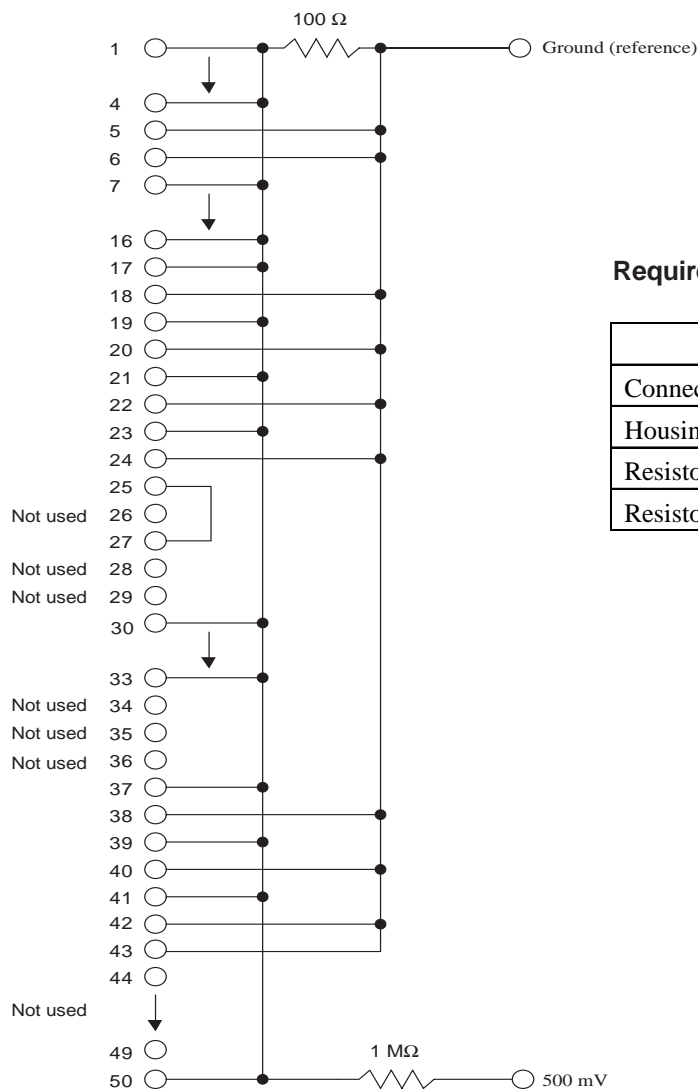
Off

Montage:

(G-) (G+)

Any electrode 0 V

Circuit diagram



To PSG input box Input checker

4.

Apply 500 mV sine waves between pin 50 (500 mV) and 1 (ground).
5.

With the Voltage cursor, check that the amplitude of each channel is 50 μ V/mm.
(The amplitude of C3-0V, C4-0V is 0 V: flat)

Required Parts

Description	Qty	Code No.
Connector PCR-S50FS	1	545287
Housing PCR-LS50LA	1	545394
Resistor SN14C2CT26 1.00M Ω	1	070086
Resistor SN14C2CT26 100 Ω	1	066242

Checking the Input Signal for Each Channel

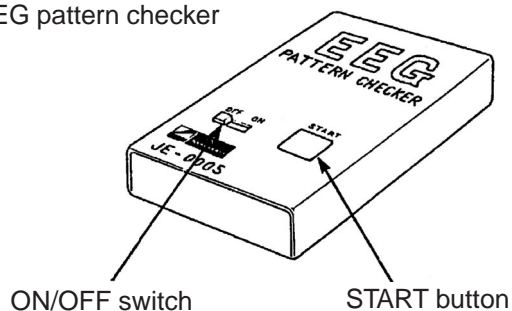
You can check that applied input signals are correctly processed for each channel with the JE-0005 EEG Pattern Checker and YZ-0243 JE-912A/AK Connection Cable.

1. Connect the EEG pattern checker to the multiple connector of the PSG input box with the JE-912AK connection cable (Code No.: 545634).
2. Start the Acquisition program.
3. Set the EEG instrument to the following settings.

High-cut filter:	Off
Time constant:	1 or 0.3 s
Sensitivity:	10 μ V/mm
AC filter:	Off
Reference:	Off
Sweep speed:	10 s/page
Montage setting:	Set as shown left
4. Turn on the power of the EEG pattern checker and press the START button.

Pattern					
CH	G1	G2	Sens	TC (s)	HF (Hz)
1	A1	A2	ACC	ACC	ACC
2	C3	C4	ACC	ACC	ACC
3	O1	O2	ACC	ACC	ACC
4	X1	X2	ACC	ACC	ACC
5	X3	X4	ACC	ACC	ACC
6	X5	X6	ACC	ACC	ACC
7	X7	X8	ACC	ACC	ACC
8	X9	X10	ACC	ACC	ACC
9	X11	X12	ACC	ACC	ACC
10	X13	X14	ACC	ACC	ACC
11	X15	X16	ACC	ACC	ACC
12	X17	X18	ACC	ACC	ACC
13	X19	X20	ACC	ACC	ACC
14	X21	0V	ACC	ACC	ACC
15	A1	0V	ACC	ACC	ACC
16	A1	0V	ACC	ACC	ACC
17	A1	0V	ACC	ACC	ACC
18	A1	0V	ACC	ACC	ACC
19	A1	0V	ACC	ACC	ACC
20	A1	0V	ACC	ACC	ACC
21	A1	0V	ACC	ACC	ACC
22	A1	0V	ACC	ACC	ACC
23	A1	0V	ACC	ACC	ACC
24	A1	0V	ACC	ACC	ACC
25	A1	0V	ACC	ACC	ACC
26	A1	0V	ACC	ACC	ACC
27	A1	0V	ACC	ACC	ACC
28	A1	A1	ACC	ACC	ACC
29	A1	A1	ACC	ACC	ACC
30	A1	A1	ACC	ACC	ACC
31	A1	A1	ACC	ACC	ACC
32	A1	A1	ACC	ACC	ACC

EEG pattern checker



5. Check the montage setting on the screen.

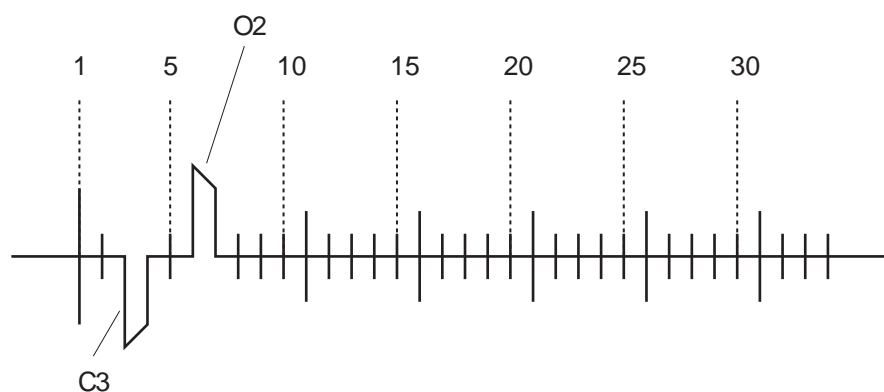
The relationship between clock signal and electrode is as follows

Clock Signal No.	1	2	3	4	5	6	7	8	9	10
Electrode	A1	A2	C3	C4	O1	O2	X1	X2	X3	X4

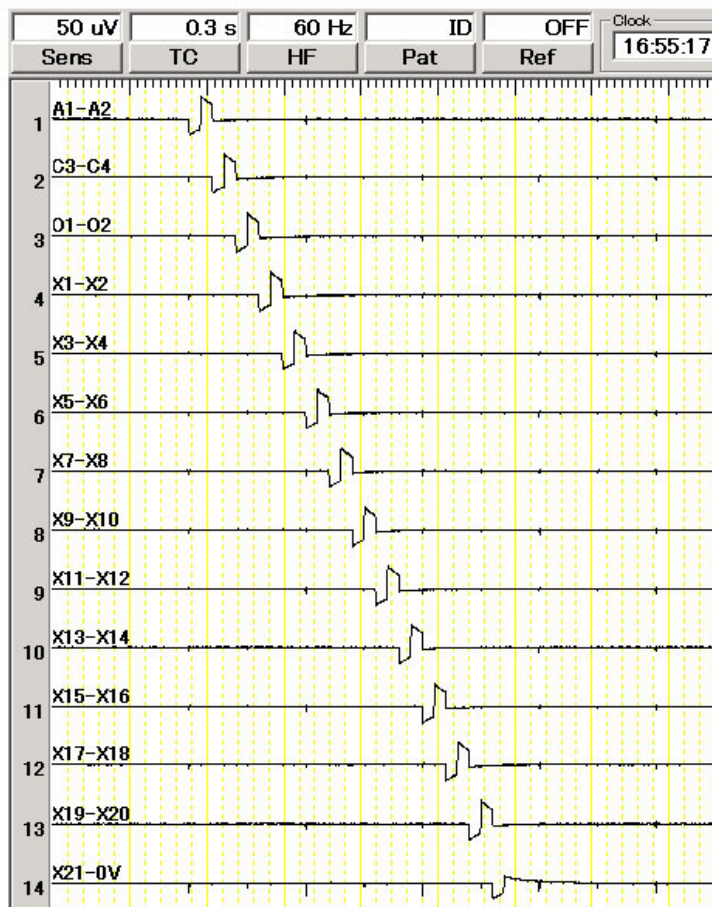
Clock Signal No.	11	12	13	14	15	16	17	18	19	20
Electrode	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14

Clock Signal No.	21	22	23	24	25	26	27
Electrode	X15	X16	X17	X18	X19	X20	X21

The negative or positive pulse signal appears according to the montage setting for each channel. The montage of the following example is G1 (+): C3 and G2 (-): O2.



When the G2 (-) electrode is set to “0 V”, only the negative pulse according to the selected electrode appears for the channel.



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Section 6 Replaceable Parts List

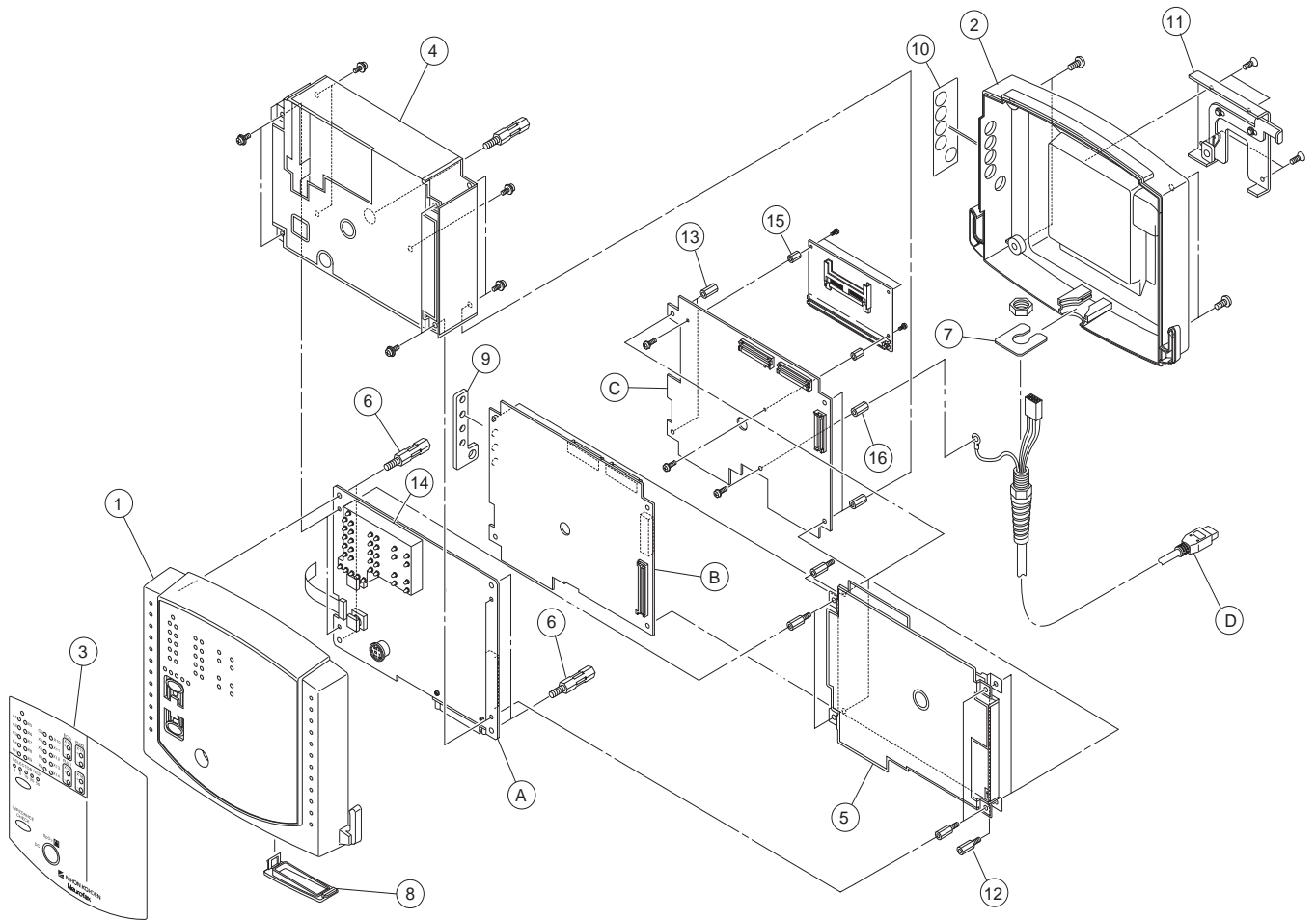
JE-912AK PSG Input Boxt	6.2
JE-914A Mini Junction Box	6.4

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When ordering parts or accessories from your nearest Nihon Kohden Corporation distributor, please quote the NK code number and part name which are listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs. Always use Nihon Kohden parts and accessories to assure maximum performance from your instrument.

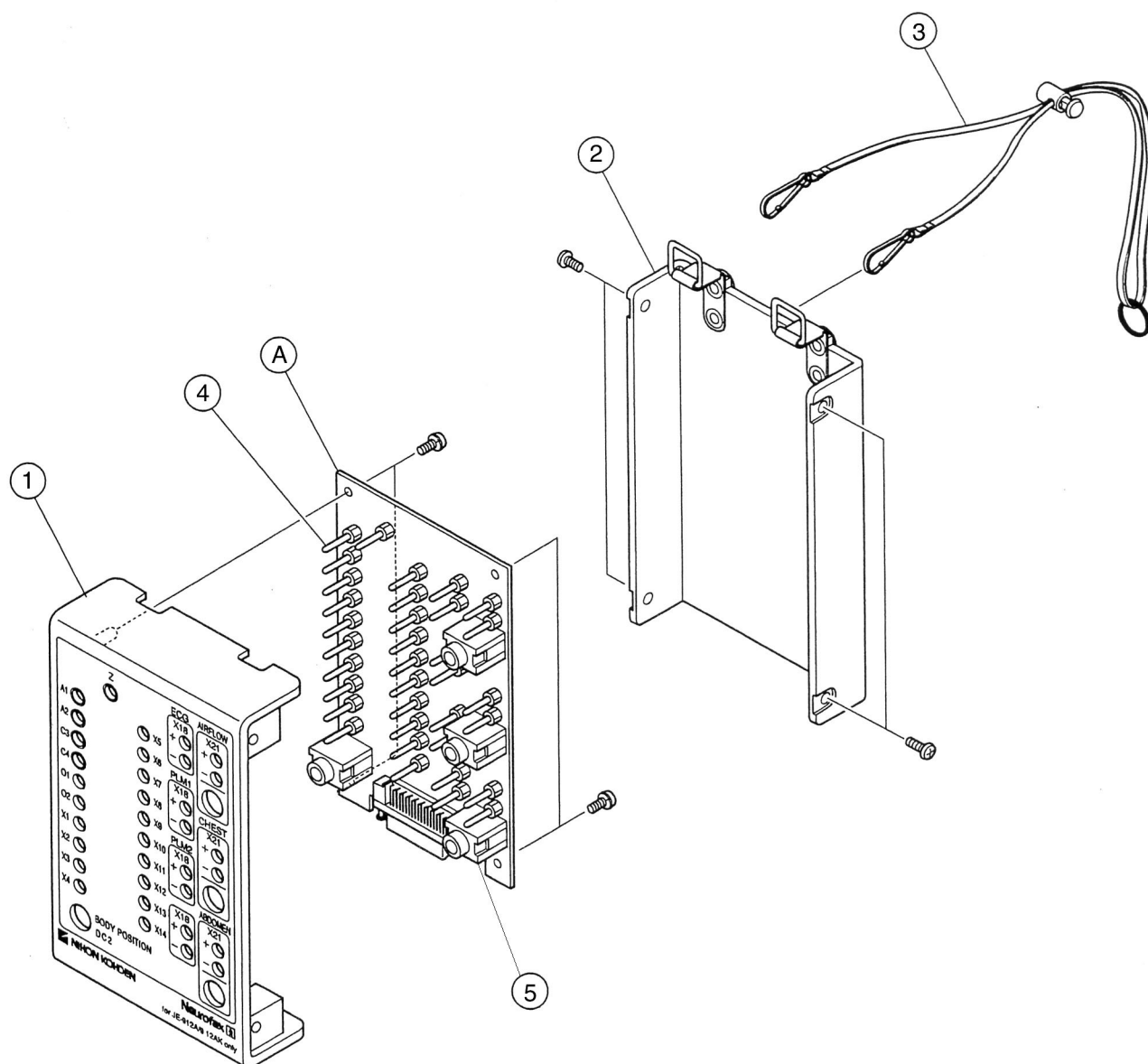
JE-912AK PSG Input Box

Index	Code No.	Q'ty	Description
1	6112-015677	1	Front cover
2	6112-014286B	1	Rear cover
3	6132-013266B	1	Front panel for JE-912AK
4	6112-015499	1	Shiled sheet (OUT)
5	6112-014259A	1	Shiled sheet (IN)
6	6114-056263A	5	Floating bolt
7	6124-032421B	1	USB cable holder
8	6114-11809B	1	Connector cover
9	6114-117447	1	Sponge
10	6124-000668C	1	DC INPUT panel
11	6114-000668C	1	Holder attachment
12	127997	8	Spacer bolt (L9)
13	292015	4	Spacer nut (L12)
14	6114-121585	1	LED spacer
15	596712	3	Spacer (L7)
16	128069	1	Spacer nut (L9)
A	UT-0727	1	PSG INPUT board
B	UT-0728	1	PSG AMP board for
C	UT-0729	1	PSG MOTHER board
d	531079	1	JE912AK USB cable



JE-914 Mini Junction Box

Index	NK Code No.	Qty	Description
1	6112-005072B	1	Front panel
2	6143-01177	1	Rear cover assy
3	6113-041094A	1	Strap
4	6114-005612	35	Electrode jack
5	273482	4	Sensor jack
A	UT-0730	1	PSG JUNCTION board



Section 7 Connector Pin Assignment

- Input/Output Connector/Jack Pin Assignment 7.1
 - PSG Input Box 7.1
 - SpO₂ Connector 7.1
 - DC Input Connector 7.1
 - REMOTE MARK Connector 7.1

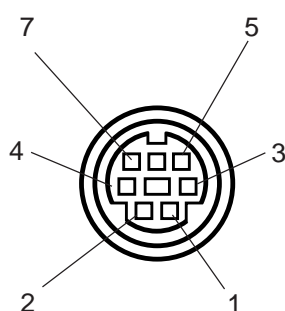
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Input/Output Connector/Jack Pin Assignment

WARNING

Connect only the specified instruments to the connectors or socket marked with \triangle , by following the specified procedure. Otherwise, electrical leakage current may harm the patient and operator.

PSG Input Box



Unit side: TCS7678-01-201

Cable side: MP-371/7

SpO₂ Connector

PIn No.	Signal
1	DGND
2	Not used
3	+5 V OUT
4	RxD
5	TxD
6	Not used
7	CON CHK

DC Input Connector

Max, ± 3 V, input impedance 1.5M Ω

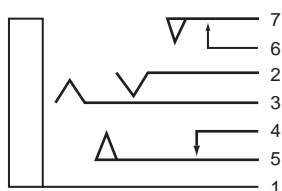


Unit side: HSJ1462-01-010 (Code No.: 608389)

Cable side: 2.5 ϕ miniature jack, KP-2S (Code No: 608406)

PIn No.	Signal
1	DGND
2	DC INPUT (channel 3, 5, 7, 9)
3	DC INPUT (channel 4, 6, 8, 10)

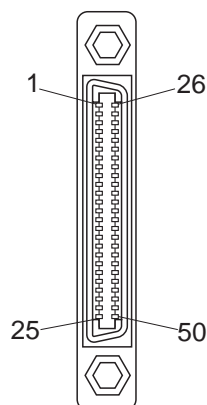
REMOTE MARK Connector



Unit side: HSJ2000-01-010 (Code No.: 501503)

Cable side: 3.5 ϕ miniature jack (Code No: 606907)

PIn No.	Signal
1	Not used
2	MARK INPUT
3	DGND
4 to 7	Not used

Multiple Connector

Unit side: PCR-E50LMD-SLB1
(Code No.: 513713)

Cable side: Connector - PCR-S50FS
(Code No.: 545287)
Housing- PCR-LS50LA
(Code No.: 545394)

WARNING

When the JE-914A Mini Junction Box is not used, make sure that the multiple connector cover is firmly attached to the PSG input box. Failure to follow this warning may cause electrical shock to the patient and operator.

CAUTION

Only connect the JE-914A Mini Junction Box. When another type of mini junction box is connected, the PSG input box malfunctions.

Pin No.	Signal	Pin No.	Signal
1	X5	26	DC2 (BODY)
2	X6	27	MINI-DTC
3	X7	28	Not used
4	X8	29	X19
5	C3	30	X1
6	C4	31	X2
7	X9	32	X3
8	X10	33	X4
9	O1	34	X20
10	O2	35	X21
11	A1	36	Not used
12	A2	37	X19 + (FLW)
13	X11	38	X19 – (FLW)
14	X12	39	X20 + (CHT)
15	X13	40	X20 – (CHT)
16	X14	41	X21 – (ABD)
17	X15 + (ECG)	42	X21 – (ABD)
18	X15 – (ECG)	43	Z
19	X16 + (PLM1)	44	X19_SEL
20	X16 – (PLM1)	45	X20_SEL
21	X17 + (PLM2)	46	X21_SEL
22	X17 – (PLM2)	47	Not used
23	X18 +	48	Not used
24	X18 –	49	Not used
25	AGND	50	Not used